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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/582,259
Filing Date: February 21, 2007
Appellant(s): LEROUX ET AL.

Christopher J. Cronin
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed on September 20 2010 appealing from the Office action mailed on February 18 2010

(1) Real Party in Interest

The examiner has no comment on the statement, or lack of statement, identifying by name the real party in interest in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The following is a list of claims that are rejected and pending in the application:

Claims 16-21, 23-24 and 29-30 are pending.

(4) Status of Amendments After Final

The examiner has no comment on the appellant's statement of the status of amendments after final rejection contained in the brief.

(5) Summary of Claimed Subject Matter

The examiner has no comment on the summary of claimed subject matter contained in the brief.

(6) Grounds of Rejection to be reviewed on Appeal

The examiner has no comment on the appellant's statement of the grounds of rejection to be reviewed on appeal. Every ground of rejection set forth in the Office action from which the appeal is taken (as modified by any advisory actions) is being maintained by the examiner except for the grounds of rejection (if any) listed under the subheading "WITHDRAWN REJECTIONS." New grounds of rejection (if any) are provided under the subheading "NEW GROUNDS OF REJECTION."

(7) Claims Appendix

The examiner has no comment on the copy of the appealed claims contained in the Appendix to the appellant's brief.

(8) Evidence Relied Upon

6,910,879	Dugue et al	6-2005
4,761,132	Khinkis	8-1988
5,759,022	Koppang et al	6-1998

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

First ground of Rejection for Review on Appeal:

Claims 16-21, 23-24 and 29-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dugue et al 6,910,879 in view of Khinkis 4,761,132. Dugue teaches the invention as claimed (fig 1-6).

With regard to claim 16 Dugue discloses (fig 3) a jet of fuel and at least two jets of oxygen-rich oxygenated gas, the first jet of oxygen-rich oxygenated gas 32 (through 28), called the primary jet, being injected so as to be in contact with the jet of fuel 31 (column 7 lines 10-12) and so as to generate incomplete first combustion (column 8 lines 50-51), the gases output by this first combustion still including at least one portion of the fuel, and the second jet of oxygen-rich oxygenated gas 30 (through 27) being injected at a distance L1 (d1) from the jet of fuel so as to combust with a first portion of the fuel present in the gases output by the first combustion, wherein an oxygen-lean (column 4 lines 48-59) oxygenated gas (secondary) is injected (through 26) at a distance L2 (d2) from the jet of fuel so as to combust with a second portion of the fuel present in the gases output by the first combustion, and in that L2 is greater than L1 (see fig 3b).

Dugue does not specifically disclose that the primary jets inject oxygen-rich oxygenated gas even though he suggests that (see column 3 lines 46-52).

Khinkis teaches oxygen enriched combustion system (fig 1) wherein oxygen-rich gas is first provided for sub-stoichiometric combustion of the fuel (column 3 lines 46-51) before the fuel is further reacted with oxidizer (see fig 1).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Dugue's invention by using oxygen-rich oxygenated gas for the primary sub-stoichiometric combustion in order to provide a furnace with enhanced efficiency and reduced NOx emission as taught by Khinkis (column 1 lines 10-13).

With regard to claim 16 Dugue does not specifically discloses that the area of the cross section of the injection orifice for the oxygen-lean oxygenated gas is between 4 and 100 times the area of the injection cross section for the second jet of oxygen-rich oxygenated gas. However, fig 3b shows that the diameter of the second jet of oxygen-rich orifice 30 is d3 the diameter of the oxygen-lean orifice 38 is D. One notes from columns 3 lines 5-45 and column 5 lines 16-26 that the maximum value of D = d2/5; d3 > d1/10 or d3=d1; d2 > d1 or d2=d1 (but in fig 3b d2 > dl); hence D is greater than d3. Therefore Dugue's disclosure suggests that the area of the cross section of the injection orifice for the oxygen-lean oxygenated gas is larger than that of the second jet of oxygen-rich oxygenated gas injection orifice.

The limitation that the oxygen-lean oxygenated gas injection orifice area to be between 4 and 100 times the injection cross section area of the second jet of oxygen-rich gas is deemed a matter of optimization within prior art conditions; "where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955) MPEP 2144.05 II A.* In this case Dugue disclosures the general condition that the oxygen-lean oxygenated gas injection orifice

area is larger than the injection cross section area of the second jet of oxygen-rich gas as discussed above.

With regard to claim 17 Khinkis also teaches wherein the oxygen-rich oxygenated gas has an oxygen concentration of greater than 30% by volume (column 3 lines 46-48).

With regard to claim 18 Dugue also discloses wherein the oxygen-lean oxygenated gas has an oxygen concentration of at most 30% by volume (less than 30%) (column 4 lines 48-59).

With regard to claim 19 Dugue also discloses a wherein the distance L1 is between 5 and 20 cm (d1 < 30 cm) (column 3 lines 5-7).

With regard to claim 20 Dugue also discloses wherein the distance L2 is greater than 30 cm (d2 < 63 cm, derived from data in column 3 lines 29-31,35-38).

With regard to claim 21 Dugue also discloses wherein the quantity of oxygen injected by the jets of oxygen-rich oxygenated gas represents 10 to 50% of the total quantity of oxygen injected (column 3 lines 46-51).

With regard to claim 23 Dugue also discloses wherein the oxygen-lean oxygenated gas is preheated before being injected (column 4 lines 49).

With regard to claim 29 Khinkis also teaches using the method of claim 16 for heating a glass charge or for a reheat furnace (column 3 lines 1-2).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Dugue's invention by using the method of claim 16 for heating a glass charge in order to provide a furnace with increased heat transfer to the furnace load and reduced NOx emission as taught by Khinkis (column 1 lines 10-13).

With regard to claim 30, the method of claim 16 is capable of being used when a continuous production of oxygen is interrupted or when the production is not interrupted. It is within the purview of one of ordinary skill in the art to use bottled oxygen when the production of oxygen is interrupted and to use oxygen from the production line when the production of oxygen is not interrupted. For example Koppang (US 5,759,022) discloses the use of bottled liquid oxygen in a combustion system (fig 3), oxygen from an oxygen production line can also be used in this set-up by connecting the line to the compressor 41 when the liquid line is not used.

Second Ground of Rejection for review on Appeal

Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dugue in view of Khinkis and further in view of Koppang et al 5,759,022. Dugue in view of Khinkis teaches the invention as claimed and as discussed above except for the oxygen-rich oxygenated gas being derived at least partly from a liquid oxygen storage unit.

Koppang teaches a combustor wherein the oxygen-rich oxygenated gas is derived at least partly from a liquid oxygen storage unit 38 (fig 3A).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Dugue in view of Khinkis's invention by including the use of liquid oxygen from a storage unit in order to provide a means of stocking large quantity of oxygen which can be easily replenished to minimize production interruption.

With regard to method claims 16-21,23-24 and 29-30 through the normal use and operation of Dugue in view of Khinkis and further in view of Koppang's invention discussed above the limitation of method of use recited in claims 16-21, 23-24 and 29-30 will inherently be met.

(10) Response to Argument

A. Grounds of rejection No. 1

Claims 16-21, 23 and 29-30 are obvious over Duque in view of Khinkis.

First, the Examiner's application of *In re Aller* and the Examiner's finding of facts underlying such application are supported by substantial evidence. Second, the Examiner's rejection is a successful showing under the teaching-suggestion-motivation (TSM) test or under other rationales identified by the Supreme Court in KSR v. Teleflex. Third, the modification of Dugue with the teachings of Khinkis suggested by the Examiner would have resulted in the claimed subject matter.

(1) Examiner maintains that in applying *In re Aller* it is shown that Dugue discloses the general conditions of the claim. Fig 3b of Dugue shows that the diameter

of the second jet of oxidizer orifice 30 is d3 the diameter of the oxygen-lean oxidizer orifice 38 is D. One notes from columns 3 lines 5-45 and column 5 lines 16-26 that

5D is less than or equal to d2; hence 5D can be equal to d2 ..... (1)

d1 is less than or equal to 10d3; hence 10d3 can be equal to d1 .... (2)

d1 is less than or equal to d2, but from fig 3b it is clearly shown that d2 is more than three times d1.

If one takes the equal to relationships in equations (1) and (2) then

5D = d2 .... (1)

10d3 = d1 ..... (2) then if

d2 = 3d1 ... (3), using the three equations above one can derive that D = 6d3 and the math is not flawed. Since only the equal to relationships was used in the derivation one can conclude that D can be about 6 times d3. Hence the oxygen lean orifice diameter can be 6 times the diameter of the oxygen rich orifice. Of course the areas would differ by about 36 times.

It is therefore quite clear that Dugue teaches the general condition of the claim, namely; that the area of cross-section of the injection orifice for the oxygen-lean oxidizer is capable of being many times larger (up to about 36 times larger) than the area of the injection cross-section of the second jet of the oxygen-rich oxidizer gas. Therefore,

Examiner's application of *In re Aller* and the Examiner's finding of facts underlying such application are supported by substantial evidence.

Examiner acknowledges Applicant's reason for making the area of cross-section of the injection orifice for the oxygen-lean oxidizer many times larger than the area of the injection cross-section of the second jet of the oxygen-rich oxidizer gas and notes that those reasons are within the knowledge of one of ordinary skill in the art of combustion and burner design.

(2) Examiner's Rejection is A Successful Showing Under the Teaching-Suggestion-Motivation (TSM) Test. The proposed modification of Dugue in view of Khinkis would not require substantial reconstruction and redesign of elements shown in Dugue. Dugue discloses the primary oxidizer coming in at 23 and 24 and the secondary oxidizer coming in at 26 (see fig 3b). The primary oxidizer supplies oxidant for the primary reaction of the fuel. Appellant's invention shows similar features. In Khinkis's invention primary reaction of the fuel and oxidizer takes place in the cracking chamber where sub-stoichiometric combustion takes place (col 3 lines 49-50). Khinkis teaches using oxygen-rich oxidizer as the primary oxidizer (just like in Appellant's invention p. 4 lines 35-39). The concept borrowed from Khinkis is to use oxygen-rich oxidizer as the primary oxidizer in the primary combustion. One of ordinary skill in art does not need to modify the structures of Dugue since the ports for injection of primary oxidizer are already provided and labeled (see fig 3b).

(3) The modification of Dugue with the teachings of Khinkis would have resulted in the claimed subject matter. The modification of Dugue in view of Khinkis would not relocate the injection of the secondary oxidant. As explained above the concept borrowed from Khinkis is to use oxygen-rich oxidizer as the primary oxidant. Since the injection ports for the injection of the primary oxidizer has been provided and labeled (see fig 3b) by Dugue no structural modifications are needed. The modification would not change the relationship between L1 (d1 in Dugue) and L2 (d2). In Dugue's fig 3b, d2 > d1, therefore the modification of Dugue by the teaching of Khinkis would not change the mathematical relationship between L2 (d2) and L1 (d1).

B. Grounds of rejection No. 2

Because claim 24 depends from claim 16 and Dugue in view of Khinkis renders claim16 obvious, the rejection of claim 24 over the combination of Dugue, Khinkis and Koppang is proper.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/Chuka C Ndubizu/

Examiner, Art Unit 3743

Conferees:

/Kenneth B Rinehart/

Supervisory Patent Examiner, Art Unit 3743

/Robin O. Evans/
Supervisory Patent Examiner, Art Unit 3753